A topographic map of California, showing the state's terrain in shades of brown and tan against a blue background. The map is oriented vertically, with the northern part at the top and the southern part at the bottom. The text is overlaid on the right side of the map.

*Farm Management
Practices That
Minimize Pesticide
Movement to
Ground Water*

**California
Department of
Pesticide Regulation**

Pesticides move to ground water in varied climate and soil conditions

High Rainfall

- Residue movement is difficult to control in areas of high annual rainfall.

Finer Textured Soils

- Residue moves off fields in runoff from loamy or clayey soils with low infiltration.
- Residues found in ground water from use on crop/soil combinations, such as flooded rice on clay soils, that were thought to have little pesticide movement.

Hardpan Soils

- Characterized by low infiltration rates.
- Contamination can result from residue movement in runoff to drainage wells or recharge areas.

Coarse, Sandy Soils

- Characterized by high infiltration rates and low water holding capacity.
- Contamination results from leaching which is movement of residues with percolating water that recharges the ground water.



Adopting the tips in this pamphlet will prevent the movement of pesticides to ground water

Pest Management

- Recent research and technological advances are increasing pesticide effectiveness and economic investment by metering applications to established problems.
- Investigate control methods that can reduce or eliminate pesticide use:
 - Cover crops,
 - Mulches either plastic or organic,
 - Mechanical pest control.
- Consult your Cooperative Extension representative for more information.

Pesticide Selection

- Pesticides found in ground water have been soil-applied, and used for soil fumigation, nematode control, and pre-emergence weed control.
- See next page for potential contaminants.

Pesticides Found in California Ground Water

Soil Fumigants – DBCP, EDB, 1,2-D.
Herbicides – atrazine, bentazon, bromacil, diuron prometon, simazine, TPA (breakdown product of chlorthal dimethyl).
Insecticides/Nematicides – aldicarb sulfoxide, aldicarb sulfon (breakdown products of aldicarb).

Additional Pesticides Found in Ground Water of Other States

Soil Fumigants – propylene dichloride
Herbicides – alachlor, chloramben, cyanazine, 2,4-D, dicamba, metolachlor, metribuzin, norflurazon, picloram, propachlor.
Insecticides/Nematicides – carbofuran, dieldrin, dinoseb, fonofos, oxaml,
Fungicides – chlorothalonil.

Pesticides With Potential to Move to Ground Water

DPR has developed a list of pesticides with the potential to move to ground water. For further information contact (916)-324-4100.

Proper use and soil placement Reduces residue movement

Incorporation

- Incorporation of soil-applied pesticides maximizes effectiveness.
- Incorporation prevents offsite movement in runoff resulting from irrigation, rainfall, or sloped landscapes.
- If you observe runoff from rainfall or irrigation, use mechanical incorporation.

Placement

- Application in furrow berms allows residues to be washed downward with percolating water: application in seedbeds reduces movement, see next page.

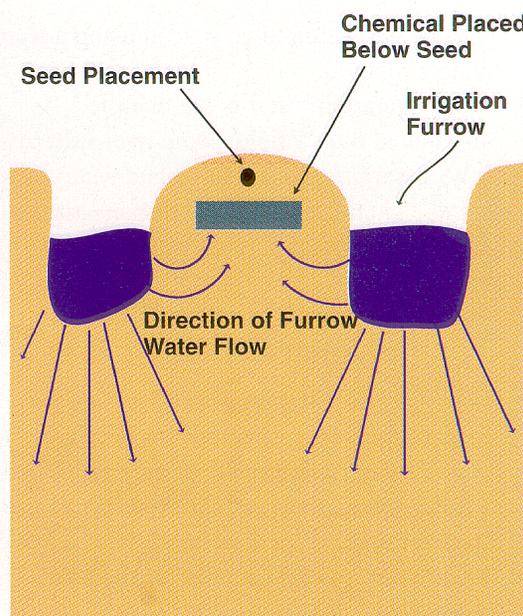
Timing

- When possible, apply agricultural chemicals after large irrigations used for leaching, deep soil watering, or frost protection.

Application Rate

- Match application rates to soil texture: use lowest effective rate.
- Calibrate spray equipment.

Pesticides placed near top of berm will contact water wicking upwards and avoid leaching. If placed in furrow bottom, residues will contact water moving downward and leach.



PESTICIDE
APPLICATION

Good irrigation management maximizes pesticide effectiveness and minimizes offsite movement

Water Amount

- Irrigate according to crop need using a water budget method.
- Since irrigation water is not evenly distributed over a field, some over watering is necessary to provide adequate water to all plants. Do not exceed percolation losses of more than 25% of applied water at each irrigation.

Irrigation Method

- Excessive percolation occurs with large, irrigation events especially early in crop growth when root growth is minimal. Flood and furrow methods on sandy soils can produce large amounts of percolation.
- Percolation can be better controlled in pressurized systems capable of applying small, frequent irrigation amounts.

Tips on Maintaining Even Water Application to Fields

Surface Irrigation

- Shorten furrow length.
- Increase water advance rates
- Use surge valves.
- Use furrow torpedoes to smooth runs.

Pressurized Systems

- Ensure system operates at designed pressure.
- Use the same nozzles or emitters.
- Keep nozzles/emitters clean.
- Flush system periodically.
- Use a filtration system.

Additional Information or Training

Irrigation application methods have been developed for California growing conditions.

For further information or for training contact:

- Irrigation Research and Training Institute,
- Cal Poly, San Luis Obispo (805) 756-2434
- Center for Irrigation Technology, California State University, Fresno (209) 278-2066
- Local UC irrigation farm advisors
- Local Irrigation Districts

Ground water contamination can also result from agricultural activities near wellheads or from faulty construction

Protect Wellhead

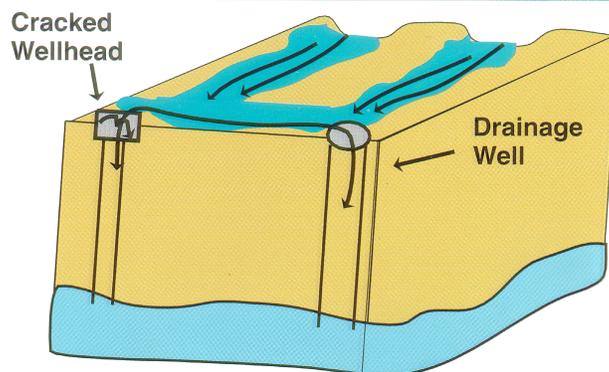
- Do not mix, load, or store pesticides near wellhead.
- Berm around wells to prevent runoff from contacting wellhead.
- Locate and properly destroy abandoned wells.
- Inspect wellheads and repair obvious cracks in pad.

Backflow Prevention

- Backflow of chemicals into wells can occur during mixing or loading, or from improperly designed or managed chemigation systems.
- Use of the following methods or equipment prevents backflow:
 - Air-gap separation,
 - Reduced pressure principle backflow prevention device,
 - Double check valve assembly.

WELLHEAD PROTECTION

Pesticide residues in runoff water can be moved to ground water through cracked wellheads or drainage wells.



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